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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,659	06/13/2001	Michael H. Myers	2807.2.14.12	6964

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EXAMINER	
LEUNG, CHRISTINA Y	

ART UNIT	PAPER NUMBER
2633	7

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/881,659	MYERS ET AL.
	Examiner	Art Unit
	Christina Y. Leung	2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 9-16* is/are rejected.

7)☒ Claim(s) *5-8 and 17-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 3.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 9, claim 9 recites the limitation "the bit duration." There is insufficient antecedent basis for this limitation because claim 1 on which it depends does not specifically recite a "bit duration."

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Falk et al. (US 4,860,279 A) in view of Barrett (US 6,160,802 A).

Regarding claim 1, Falk et al. disclose an apparatus for delay domain multiplexing of digital data signals (Figure 3), the apparatus comprising:

input paths 104(1) and 104(2) configured to carry first and second digital data signals comprising bits having a bit time corresponding thereto;

a source configured to provide laser pulses (including light sources 106(1) and 106(2), which may comprise lasers; column 1, lines 20-21);

first and second photonic modulators configured to modulate the first and second sets in accordance with the first and second digital data signals to provide first and second modulated signals corresponding thereto (Falk et al. disclose that the light sources 106 are switched on and off according to the digital data signals and thus act as modulators; column 5, lines 7-20);

first and second delay mechanisms configured to provide first and second delayed copies corresponding to the first and second modulated signals delayed by first and second delays, respectively (the longer of the two arms in each interferometer 102(1) or 102(2) provides a delayed copy of the incoming signal; column 5, lines 20-31); and

first combiners (the outputs of each interferometer 102(1) and 102(2), i.e., output waveguide 122 shown in Figure 3) configured to combine the first and second delayed copies with the first and second modulated signals, respectively, to form first and second consolidated modulated signals corresponding thereto, respectively (in other words, each interferometer combines the modulated signal on the shorter arm with the delayed copy of that signal on the longer arm to form a consolidated signal; column 5, lines 20-31).

Falk et al. do not specifically disclose first and second photonic encoders configured to convert the laser pulses into first and second sets of orthogonal codes extending for the bit time. However, it is well known in the art that orthogonal coding may be used to reduce interference between channels, as Barrett in particular teaches (column 6, lines 44-48). Barrett further teaches optical encoders for converting laser pulses into sets of orthogonal codes for transmission (column 14, lines 55-67; column 15, lines 1-21). It would have been obvious to a person of

ordinary skill in the art to include first and second encoders such as taught by Barrett in the system disclosed by Falk et al. in order to provide orthogonal coding and thus reduce interference between the optical channels. One in the art would have been particularly motivated to reduce cross-channel interference in the system disclosed by Falk et al. since Falk et al. specifically discloses multiplexing a plurality of data-carrying signals.

Regarding claim 2, Falk et al. disclose a multiplexing combiner 124 configured to combine the first and second consolidated modulated signals into a single multiplexed output for transmission over a carrier medium.

Regarding claim 3, Falk et al. disclose (Figures 4 and 5):

a splitter (such as splitter 240 in Figure 4) configured to receive and split the single multiplexed output into first and second daughter signals;

third and fourth delay mechanisms configured to provide third and fourth delayed copies corresponding to the first and second daughter signals delayed by the first and second delays, respectively (the longer of the two arms in each interferometer 202(1) or 202(2) in Figure 4 provides a delayed copy of the incoming signal; column 5, lines 54-68; column 6, lines 1-3); and

second combiners (the outputs of each interferometer 202(1) and 202(2) in Figure 4 or he outputs of each interferometer 302(1) and 302(2) in Figure 5) configured to recombine the third and fourth delayed copies with the first and second daughter signals, respectively, to form third and fourth consolidated modulated signals (again, in other words, each interferometer combines the modulated signal on the shorter arm with the delayed copy of that signal on the longer arm to form a consolidated signal).

Regarding claim 4, Falk et al. disclose first and second decoders configured to receive the third and fourth consolidated modulated signals and extract the first and second digital data signals therefrom. Figure 4, for example, shows a first decoder comprising photodetectors 204(1) and 206(1), and differential amplifier 208)(1), for extracting the first digital data signal and shows a similarly constructed second decoder for extracting the second digital data signal.

Regarding claim 13, Falk et al. disclose a method for delay-domain multiplexing of digital data signals (Figure 3), the method comprising:

providing first and second digital data signals comprising bits having a bit duration (through inputs 104(1) and 104(2));

providing laser pulses corresponding to the bits (using light sources 106(1) and 106(2), which may comprise lasers; column 1, lines 20-21);

modulating the first and second laser pulses with the first and second digital data signals to provide first and second modulated signals (column 5, lines 7-20);

providing delayed copies of the first and second modulated signals, delayed by first and second delays, respectively (the longer of the two arms in each interferometer 102(1) or 102(2) provides a delayed copy of the incoming signal; column 5, lines 20-31); and

recombining the delayed copies with the first and second modulated signals to form first and second consolidated modulated signals (each interferometer combines the modulated signal on the shorter arm with the delayed copy of that signal on the longer arm to form a consolidated signal; column 5, lines 20-31).

Falk et al. do not specifically disclose encoding the laser pulses to provide first and second orthogonal codes, each extending for the bit duration. However, it is well known in the

art that orthogonal coding may be used to reduce interference between channels, as Barrett in particular teaches (column 6, lines 44-48). Barrett further teaches optical encoders for converting laser pulses into sets of orthogonal codes for transmission (column 14, lines 55-67; column 15, lines 1-21). It would have been obvious to a person of ordinary skill in the art to provide orthogonal codes such as taught by Barrett in the method disclosed by Falk et al. in order to reduce interference between the optical channels. One in the art would have been particularly motivated to reduce cross-channel interference in the system disclosed by Falk et al. since Falk et al. specifically discloses multiplexing a plurality of data-carrying signals.

Regarding claim 14, Falk et al. disclose that first and second consolidated modulated signals are combined into a single multiplexed output (using coupler 124) for transmission over a carrier medium (fiber 118).

Regarding claim 15, Falk et al. disclose (Figures 4 and 5):

splitting the single multiplexed output to provide first and second daughter signals (using splitter 240 in Figure 4, for example);

providing first and second delayed copies the first and second daughter signals, respectively (the longer of the two arms in each interferometer 202(1) or 202(2) in Figure 4 provides a delayed copy of the incoming signal; column 5, lines 54-68; column 6, lines 1-3); and

combining the first and second delayed copies with the first and second daughter signals, respectively, to provide third and fourth consolidated modulated signals (again, each interferometer combines the modulated signal on the shorter arm with the delayed copy of that signal on the longer arm to form a consolidated signal).

Regarding claim 16, Falk et al. disclose extracting the first and second digital data signals from the third and fourth consolidated modulated signals. Figure 4, for example, shows a first decoder comprising photodetectors 204(1) and 206(1), and differential amplifier 208)(1), for extracting the first digital data signal and shows a similarly constructed second decoder for extracting the second digital data signal.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Falk et al. in view of Barrett as applied to claim 1 above, and further in view of Wickham et al. (US 6,708,003 B1).

Regarding claim 10, Falk et al. in view of Barrett describe a system including delay-domain multiplexing and orthogonal coding, but they do not specifically disclose or teach using Walsh codes. However, it is commonly known in the art that various types of codes may be used to provide the orthogonal codes taught by Barrett. Wickham in particular teaches a related system for transmitting orthogonally coded optical signals (Figures 1 and 2) wherein orthogonal Walsh codes may be used (column 5, lines 35-42). It would have been obvious to a person of ordinary skill in the art to utilize Walsh codes as taught by Wickham et al. in the system described by Falk et al. in view of Barrett as an engineering design choice of a type of encoding for providing the orthogonal encoding characteristics already taught by Barrett. Examiner further notes that Applicants also acknowledge in their specification on pages 84-85 that orthogonal codes other than Walsh codes may be used as a design choice.

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Falk et al. in view of Barrett as applied to claim 1 above, and further in view of Rzeszewski (US 4,989,199 A).

Regarding claim 11, Falk et al. in view of Barrett describe a system including delay-domain multiplexing and orthogonal coding, but they do not specifically disclose or teach that

the orthogonal codes correspond to delays selected to incur phase shifts of 0 degrees and 180 degrees in a signal encoded thereby. However, it is well understood in the art that orthogonal codes, by definition, correspond to predetermined, opposing phase shifts in the signal (such as 0 and 180 degrees). Rzeszewski in particular teaches a system for transmitting orthogonally coded signals wherein sets of orthogonal codes correspond to delays selected to incur phase shifts of 0.degree. and 180.degree. in a signal encoded thereby (column 6, lines 46-64). Although Rzeszewski does not specifically use the term "delay," it would also be well understood in the art that a shift in phase of a signal inherently comprises an adjustment in the time domain, i.e., a delay. It would have been obvious to a person of ordinary skill in the art to provide phase shifts of 0 and 180 degrees in the orthogonal codes as taught by Rzeszewski in the system described by Falk et al. in view of Barrett as an engineering design choice of a way to provide the orthogonal encoding characteristics already taught by Barrett. Again, Falk et al. in view of Barrett already teach advantages associated with orthogonal codes in general, and Barrett already teaches using phase shifting elements to provide orthogonal coding (column 5, lines 36-37; column 17, lines 34-38).

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Falk et al. in view of Barrett as applied to claim 1 above, and further in view of Hui et al. (US 6,438,148 B1).

Regarding claim 12, Falk et al. in view of Barrett describe a system including delay-domain multiplexing and orthogonal coding, but they do not specifically disclose or teach that the encoders may comprise a plurality of optical paths, having lengths selected to impose orthogonal codes on the laser pulses. However, Barrett teaches using phase shifting elements to provide orthogonal coding, and it would also be well understood in the art that a shift in phase of

a signal inherently comprises an adjustment in the time domain, i.e., a delay (column 5, lines 36-37; column 17, lines 34-38). Although Barrett is silent regarding the details of the phase-shifting elements suggested, delay lines are also well known in the art for providing particular phase shifts in signals. Hui et al. in particular teach providing a plurality of optical paths with different lengths selected to impose phase shifts between signals (Figure 1 shows delay line 42; column 2, lines 18-19). It would have been obvious to a person of ordinary skill in the art to use delay lines (i.e., optical paths having particular lengths) as taught by Hui et al. in the system described by Falk et al. in view of Barrett in order to provide the phase shift between the signals already taught by Barrett.

Allowable Subject Matter

8. Claims 5-8 and 17-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claim 9 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

Falk et al. in view of Barrett describe a system and method as discussed above with regard to claims 1, 4, and 16, including delay-domain multiplexing and orthogonal coding. However, although Falk et al. further disclose that the digital data signals may be characterized by a "bit duration," the prior art does not disclose or fairly teach the system or method including all the elements, steps, and limitations recited in claims 1, 4, or 16 and further wherein each laser

pulse specifically has a duration not greater than the bit duration of the digital data signals divided by a number of digital data signals to be multiplexed.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 703-605-1186. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

M.R. SEDIGHIAN
Patent Examiner
Art Unit: 2633